

**W**hen considered on a worldwide basis, telecommunications provides the lion's share of market opportunities for photovoltaics. Even in the U.S., there is a very large market for telecommunications both in the private sector and among military and government agencies.

Telecommunications applications range from small emergency call boxes to large microwave repeaters, and everything in between. The list of telecom applications grows continuously: relay towers, radio systems, remotely controlled systems, and cellular telephones, to name just a few. These systems range from a few watts to several kilowatts. PV is ideal for communications because the PV-charged battery provides a stable dc voltage and meets varying current demands. PV systems operate reliably—and with little maintenance.

There are thousands of telecommunications systems in use powered either by PV alone or powered by PV in conjunction with another fuel source, such as diesel. These systems, without fail, have proven that PV can increase the reliability and spatial coverage of telecommunications systems of all types.



◁ A solar-powered remote telemetry system provided by Solar Depot, San Rafael, California. This is a common application for photovoltaics. *[Photo courtesy Solar Depot]*



◁ A solar-powered cellular link. *[Photo courtesy Solar Depot]*



◁ Northern Power supplied this TeleSol™ PV stand-alone system to Cubic Corporation for a U.S. Air Force Tactical Air Combat Maneuvering and Instrumentation Range located on Nellis Air Force Base outside Las Vegas, Nevada. The sole power source is a 440W solar array comprised of 8 SM55 PV modules supplied by Siemens Solar. Energy produced, if not immediately consumed by the load, is stored in Deka Unigy II series batteries manufactured by East Penn of Lyons, Pennsylvania for this project. The 'brains' of the system is a Northern SC-50 controller. *[Photo courtesy Northern Power Systems]*



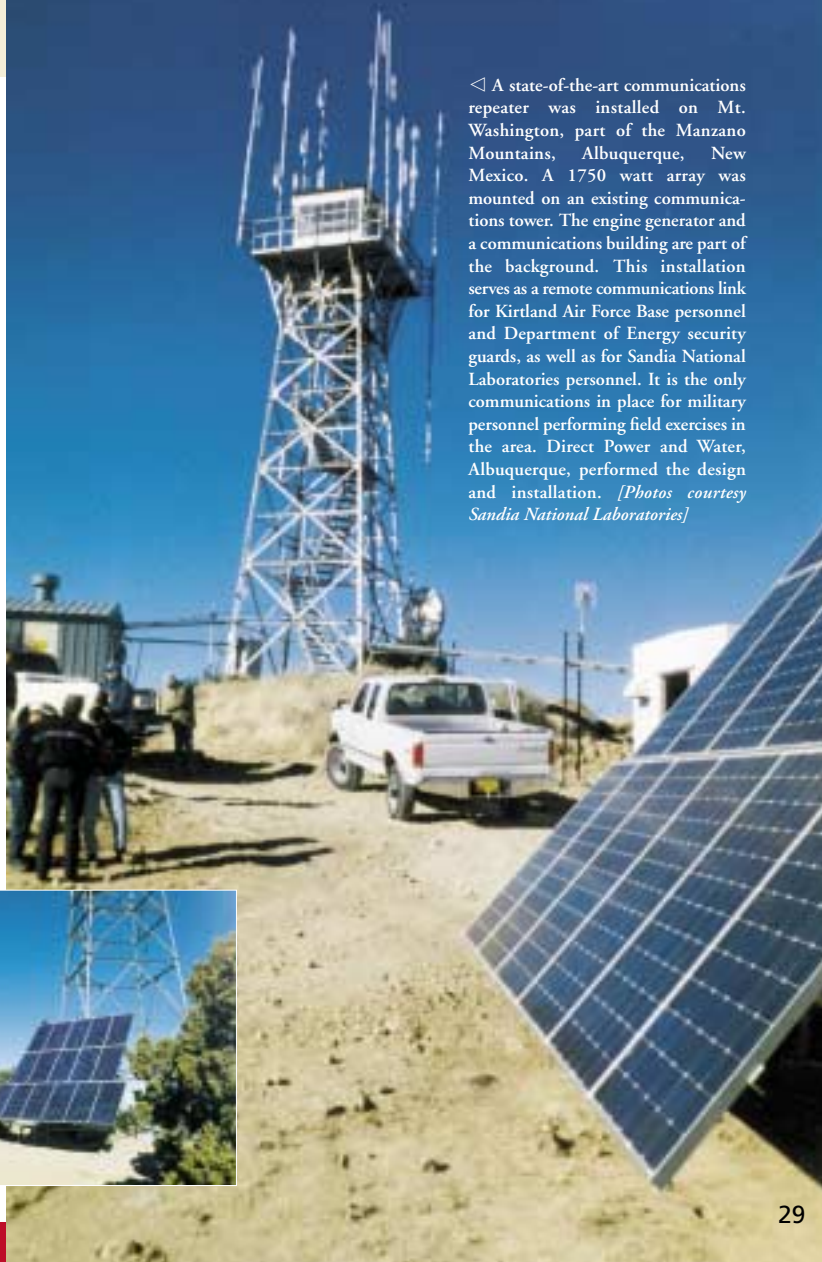
△ Northern Power Systems designed, manufactured, and installed a hybrid MicroGrid™ PV/diesel system on a 10,200' mountaintop site (Mt. Callaghan) in Central Nevada. The system serves as a master site for the Top Gun Tactical Air Combat Training System upgrade on the U.S. Navy's Fallon Range. The power system consists of an 11,872-peak watt PV array coupled with a 20kW diesel generator set. *[Photo courtesy Northern Power Systems]*



◁ Solar Depot installed this solar-powered pair-gain system. This application is well suited to PV. The twisted pairs of wire, stretching far enough that they lose their signal, benefit from the addition of a PV-powered amplifier. *[Photo courtesy Solar Depot]*



◁ Cellular repeaters are often very large or for other reasons are not always good candidates for photovoltaics. This installation by Solar Depot, however, serves an appropriate application of PV for this purpose. *[Photo courtesy Solar Depot]*



◁ A state-of-the-art communications repeater was installed on Mt. Washington, part of the Manzano Mountains, Albuquerque, New Mexico. A 1750 watt array was mounted on an existing communications tower. The engine generator and a communications building are part of the background. This installation serves as a remote communications link for Kirtland Air Force Base personnel and Department of Energy security guards, as well as for Sandia National Laboratories personnel. It is the only communications in place for military personnel performing field exercises in the area. Direct Power and Water, Albuquerque, performed the design and installation. *[Photos courtesy Sandia National Laboratories]*